Electronic supplementary material

Mobility and biodegradability of an imidazolium based ionic liquid in soil and soil amended with waste sewage sludge

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1. ESI-MS spectrum

Samples were diluted 1:50 with methanol and analyzed by electrospray ionization mass spectrometry equipped with an ion trap detector (Brucker-Daltonic GmbH, Germany). Mass spectra for cations were acquired in the positive ion mode in the scan range of m/z^+ 50–400. The ESI source conditions were set according to ref. [29] with a capillary voltage of 2000 V, drying gas flow-rate of 5 L min^{-1}, drying gas temperature at 300 °C and nebulizer at 50 psi.
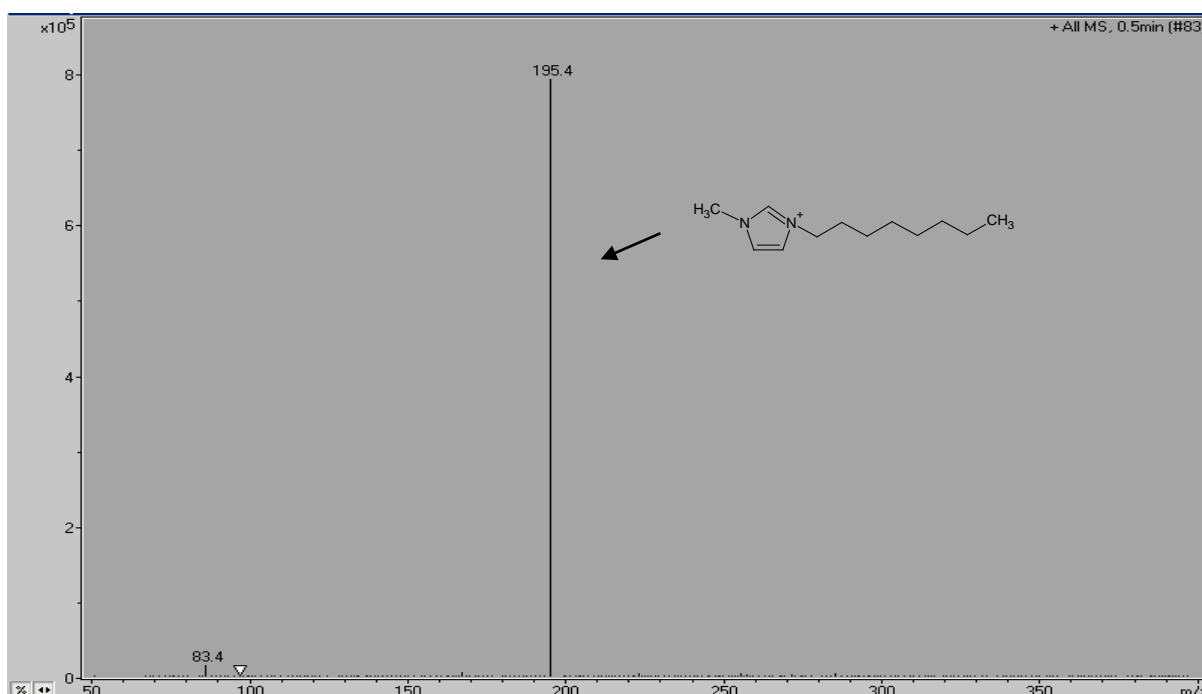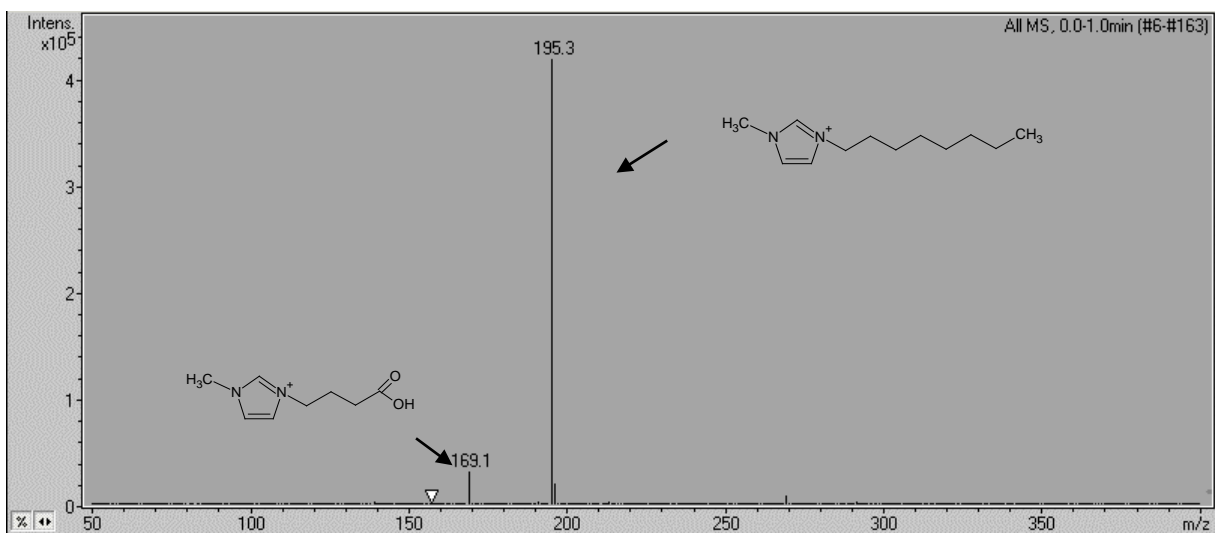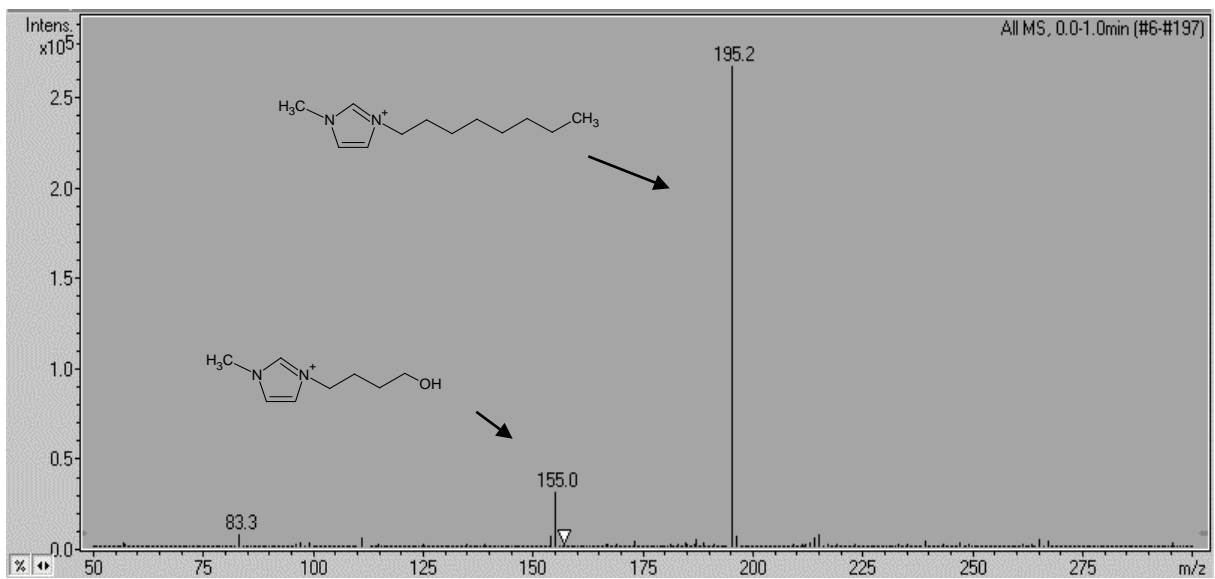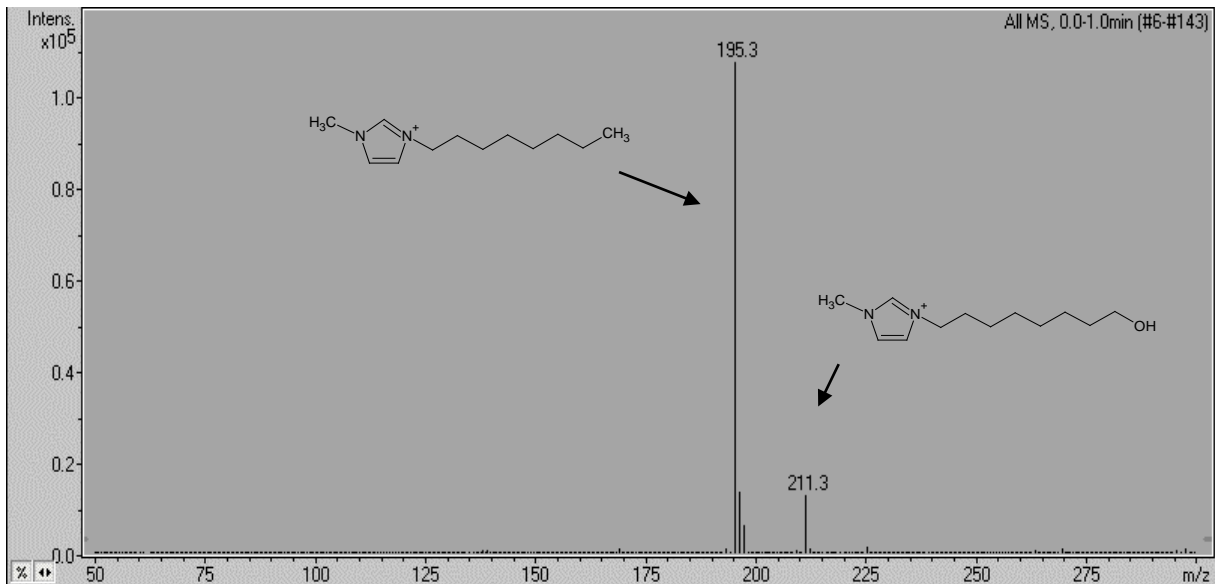

Figure S1 OMIM standard solution 5 µmol L^{-1}

Intens.
x10⁵

H_3C N⁺ N CH_3

H_3C N N⁺ OH

195.3

211.3

m/z

Intens.
x10⁵

H_3C N⁺ N CH_3

H_3C N N⁺ OH

195.2

83.3

155.0

m/z

Intens.
x10⁵

H_3C N⁺ N CH_3
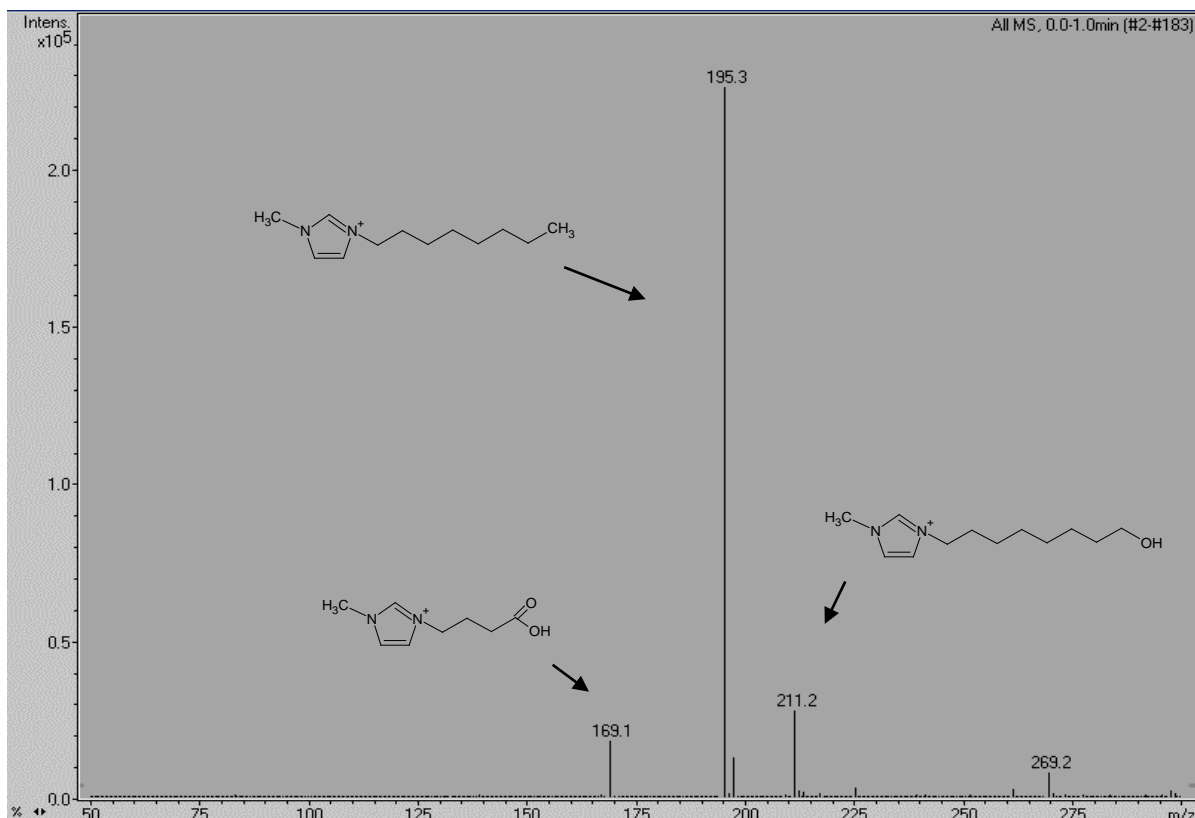
H_3C N N⁺ O OH

195.3

169.1

m/z

Figure S2. Samples of column effluent with transformation products

2. Example of a chromatogram

HPLC/UV VWR Hitachi system containing the L2130 pump, L2130 degasser, L2200 autosampler, L2300 column oven, L2450 diode array detector and the EZChrom Elite software was used for analysis with a cation exchange column (250/3 NUCLEOSIL 100-5 SA) purchased from Macherey-Nagel (Dürren, Germany) was used. The mobile phase consisted of 55% acetonitrile (HPLC grade) and 45% aqueous 20 mM KH_2PO_4 / 3.9 mM H_3PO_4 buffer. A flow rate of 0.7 mL min-1, temperature of 40°C and a detection wavelength of 212 nm were used. Here OMIM Cl sample, approximately 50 µmol L^{-1} is shown.
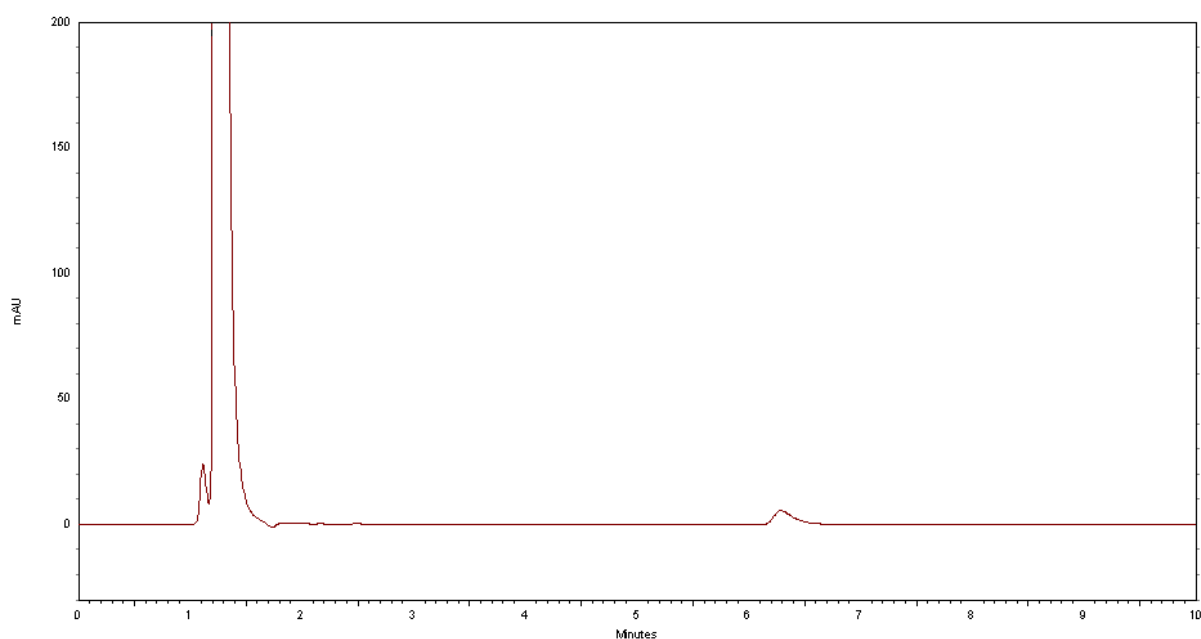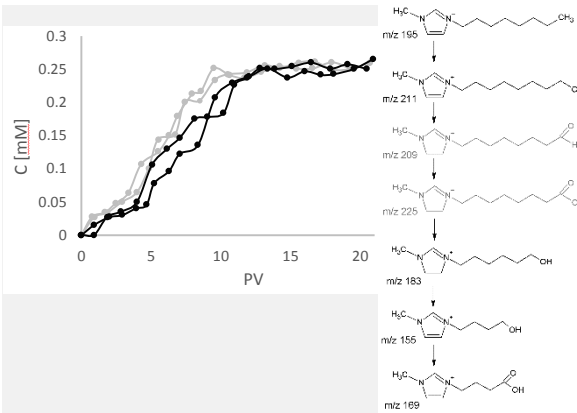

Figure S3.Example of HPLC/UV chromatogram of OMIMCl 50µmol L^{-1}

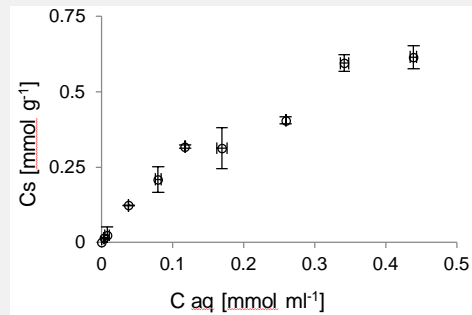3. Schematic representation of experimental approach

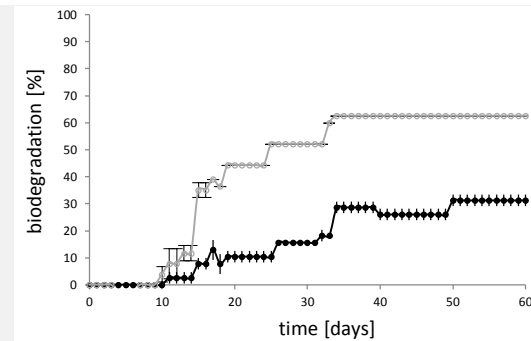| Column flushing	Batch sorption tests	Biodegradability test
➢ Breakthrough curves by HPLC/UV ➢ Transformation products by MS	➢ Sorption isotherms (HPLC/UV) ➢ Distribution coefficient K_D	➢ Biodegradability (manometric respirometry)

Figure S4. Experimental approach

4. Analysis of statistical significance of Kd values obtained in column test

Table 1. Details of statistical analysis.

	Kd mean	Standard deviation	difference of means	standard error	t-value	p-value
sand (k_{D1})	1.662	0.155	0.494	0.203	2.437	0.138
sand + sludge (k_{D2})	2.157	0.242				
LUFA (k_{D3})	1.434	0.512	1.340	0.413	3.246	0.083
LUFA + sludge (k_{D4})	2.775	0.281				

The hypothesis testing

H_0: $\mu_{kD1}=\mu_{kD2}$ or $\mu_{kD3}=\mu_{kD4}$

H_a: $\mu_{kD1}\neq\mu_{kD2}$ or $\mu_{kD3}\neq\mu_{kD4}$

Result : at $\alpha=0.05$ there is not enough evidence to reject the H_0.